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Paliphora curviapicis sp. nov. from Malaysia, and a synopsis of the genus

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Abstract— *Paliphora curviapicis* sp. nov., collected from submerged wood in Malaysia, is described and illustrated. It differs from other *Paliphora* species in having conidia with a curved apex and 3–6 distinct septa. A synopsis of characters of the six known species and a composite illustration of their conidial morphology are provided.

Key words— freshwater fungi, dematiaceous hyphomycete, lignicolous fungi, saprotroph, taxonomy

Introduction

Species of *Paliphora* Sivan. & B. Sutton (Sivanesan & Sutton 1985) are hyphomycetes characterized by dematiaceous, setiform, unbranched, thick-walled, closely multiseptate conidiophores that produce hyaline unicellular or euseptate conidia through pores on the conidiogenous cells (tretic conidiogenesis; Ellis 1971). Amongst the few dematiaceous hyphomycete genera characterized by setiform conidiophores exhibiting tretic conidiogenesis, *Paliphora* species are distinct in producing hyaline aseptate or euseptate conidia (Ho et al. 2002). In similar genera such as *Diplococcium* Grove, *Spadicoides* S. Hughes, *Polytretophora* Mercado, and *Helminthosporium* Link, the conidia are pigmented and either euseptate or distoseptate (Goh & Hyde 1996, 1998; Goh et al. 1998, Kuthubutheen & Nawawi 1991). There are five reported species of *Paliphora* (Index Fungorum 2013), all of which occur on decaying leaves. Gusmão et al. (2008) examined and provided a key to the five species.

Paliphora species are widely distributed in the tropics, including Australia (Sivanesan & Sutton 1985, Alcorn 1996), Brazil (Gusmão et al. 2008), Cuba, India (Rao & de Hoog 1986), Malaysia (Kuthubutheen 1987), Mexico (Heredia

et al. 2000), New Caledonia (Mouchacca 1990), and southern Thailand (Gusmão et al. 2008).

During a survey of fungal diversity from abandoned tin-mining ponds and associated streams in the Kinta Valley region, Malaysia, we found an undescribed *Paliphora* species on wood submerged in a stream. This species is described here and compared with other *Paliphora* species. The holotype is conserved at the herbarium of the Centre for Biodiversity Research, Faculty of Science, Universiti Tunku Abdul Rahman (Perak campus), Kampar, Malaysia (UTAR). The conidiogenous holes on the conidiophores and other ultrastructural features of this fungus were studied under the scanning electron microscope (FESEM, Model: JSM-6701F, Jeol, Japan).

Taxonomy

Paliphora curviapicis Goh, W.Y. Lau & K.C. Teo, **sp. nov.** Figs 1–15

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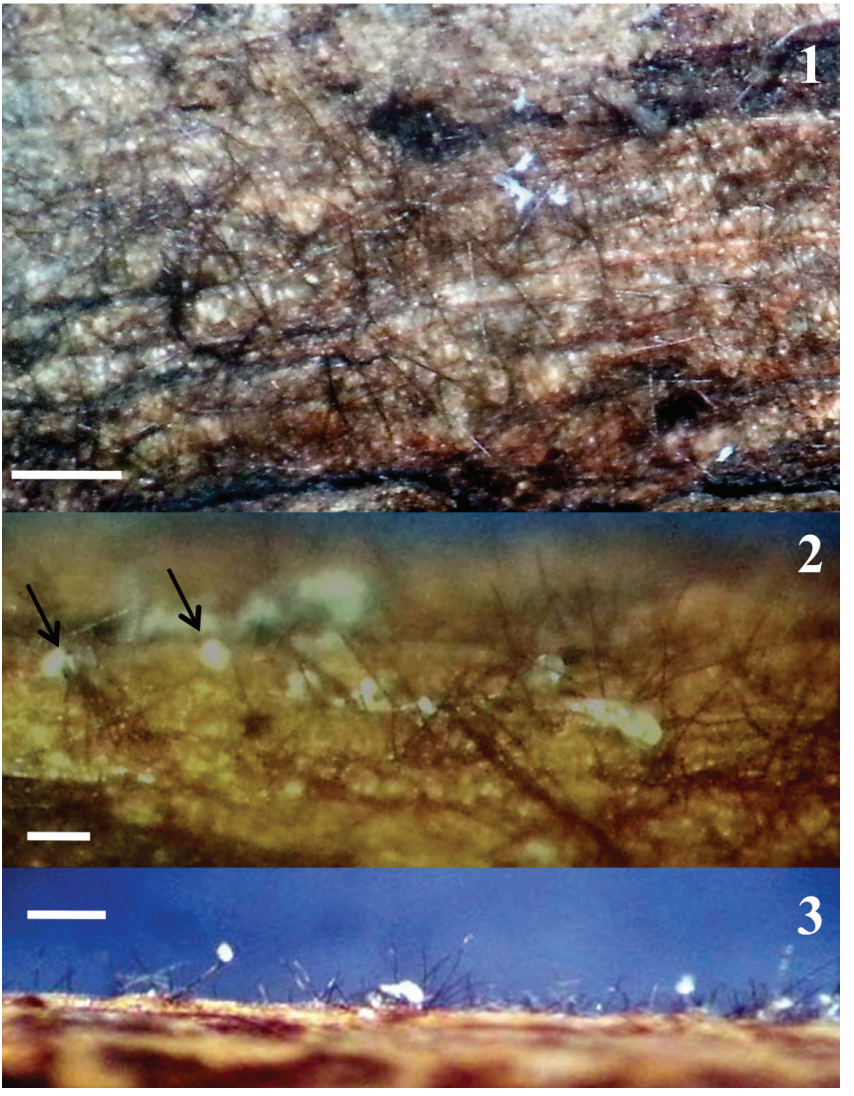
Differs from *Paliphora multiseptata* by its conidia with a curved apex and fewer septa, and its substrate of dead wood; and from other species of *Paliphora* by its conidia with a curved apex and more septa, and its substrate of dead wood.

Type: Malaysia. Perak, Menglembu, Bukit Kledang, on submerged wood, 16 September 2013, Wai-Yip Lau (**Holotype**, UTAR(M)-0002).

Etymology: *curviapicis*, refers to the characteristically curved apex of the conidia.

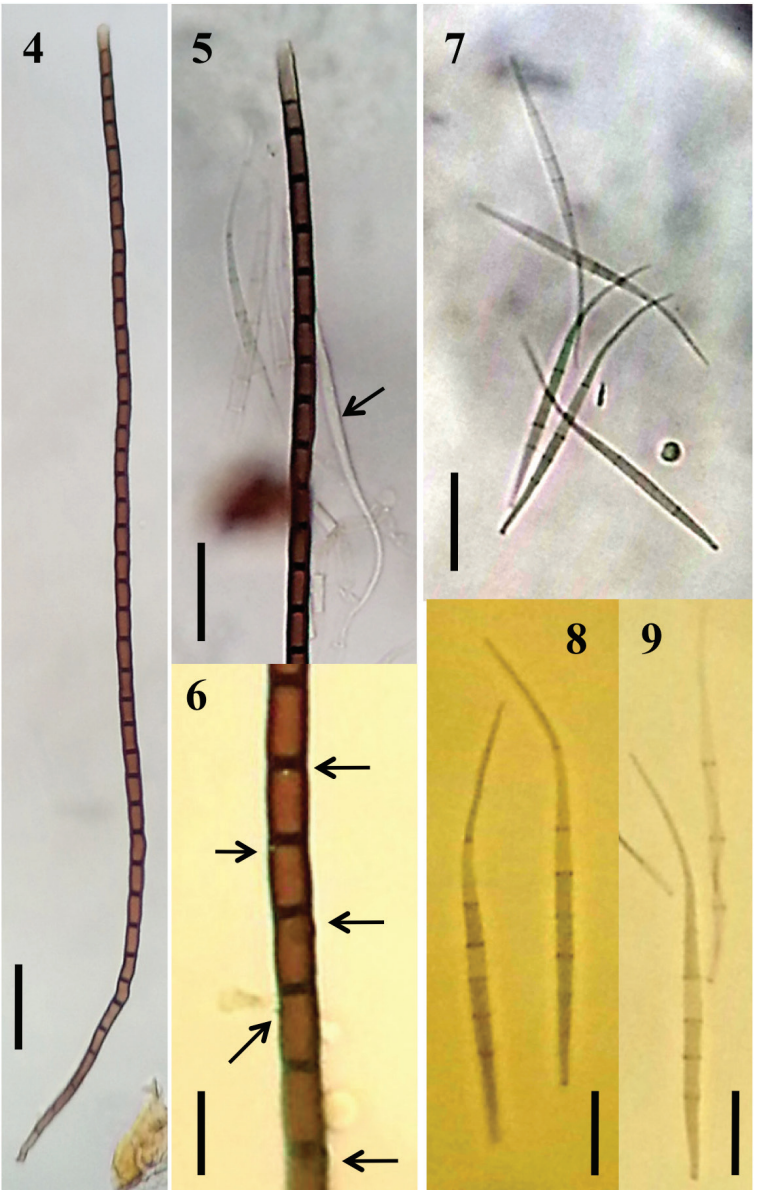
Colonies on natural substratum effuse, sparsely velvety, dark brown. Conidiophores macronematous, mononematous, setiform, 170–540 µm long, 4.5–5 µm wide, lower portion gradually tapering towards the base (2.5–3 µm wide), erect or becoming prostrate due to the length, unbranched, mostly straight, stout, thick-walled, smooth, brown, apical cell rounded and paler, with 20–63 evenly spaced (5–10 µm apart) thick septa along the shaft, slightly constricted at the septa. Conidiogenous cells integrated, intercalary, determinate, polytretic, with 1–3 pores (ca. 0.5 µm diam.) situated immediately below the thick transverse septum and often obscured by the septum. Conidia holoblastic, formed through pores in the conidiogenous cell wall, solitary, aggregated into slimy masses, thin-walled, smooth, hyaline, eguttulate, 3–6-euseptate, not constricted at the septa, elongate-fusiform or narrowly falcate, sometimes slightly sigmoid, 40–70 µm long, 2–3 µm wide at the center, tapering to an acute or obconic base, upper third slender (0.7–1.5 µm wide) or filiform and distinctly curved, tapering towards an acute apex.

Comments — *Paliphora curviapicis* is the second *Paliphora* species found in Malaysia; the previously recorded species was *P. porosa* (Kuthubutheen 1987). The other five *Paliphora* species are easily distinguished from *P. curviapicis*

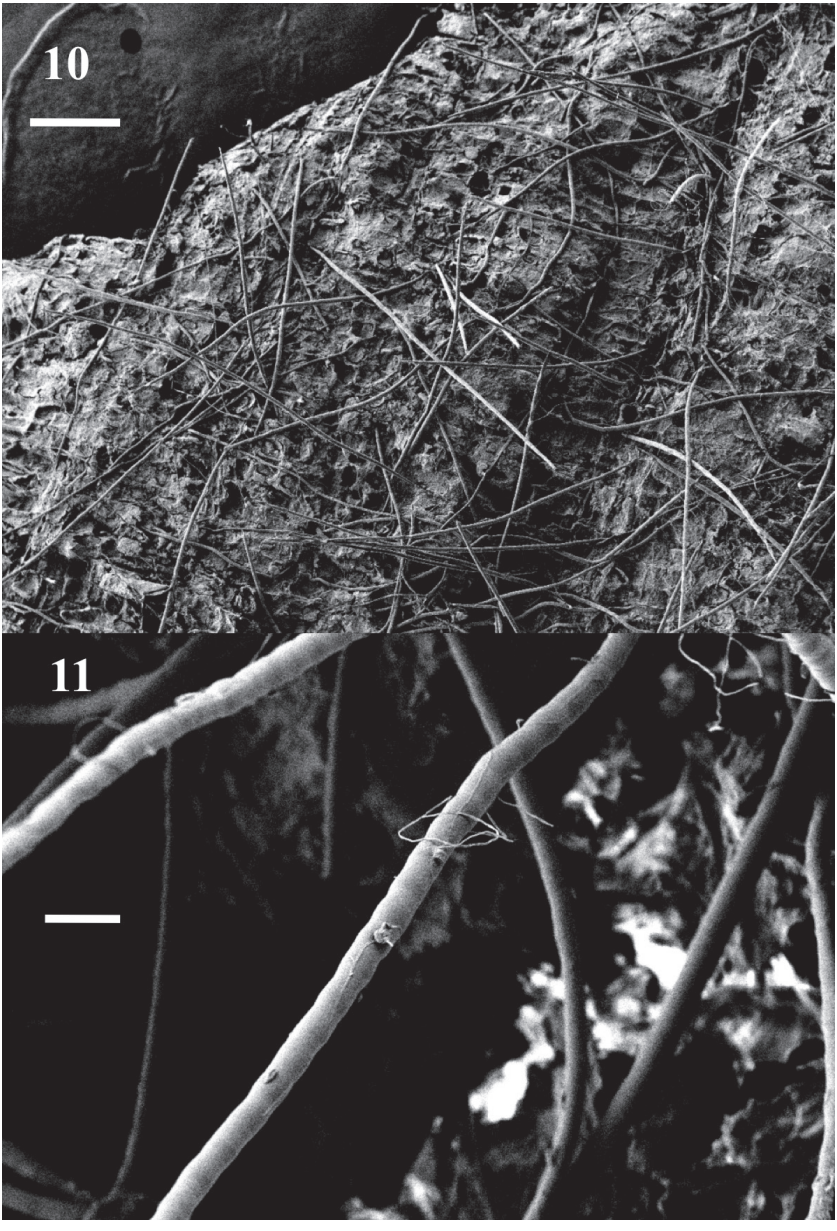


Figs 1–3. *Paliphora curviapicis* (holotype), colonies on natural substratum. 1. Surface view. 2. Oblique surface view; arrows point to slimy conidial masses. 3. Side view. Scale bars: 1, 3 = 500 µm; 2 = 200 µm.

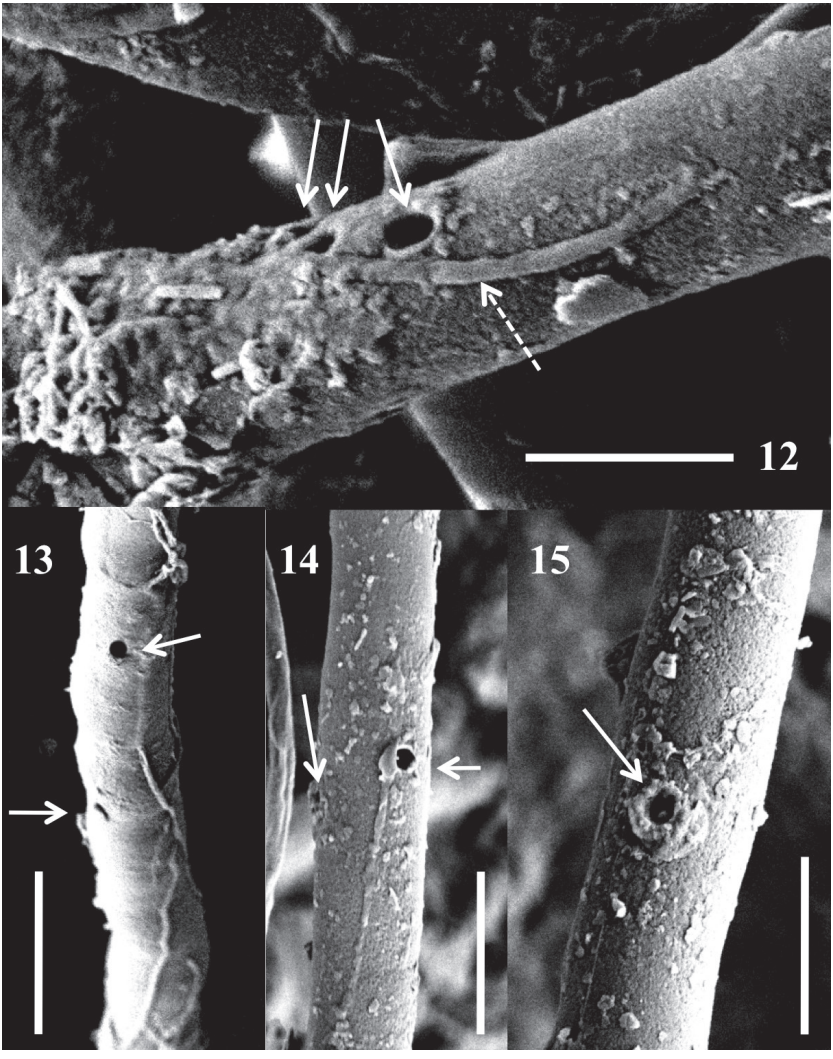
by their cylindrical, clavate, or falcate conidia with either more septa (*P. multiseptata*) or fewer septa (the other four species) and their substrate



Figs 4–9. *Paliphora curviapicis* (holotype). 4. Conidiophore with evenly spaced septa and uniform width but tapering toward the base. 5. Distal end of a conidiophore with a few conidia; arrow points to a sigmoid conidium. 6. Higher magnification of a conidiophore; arrows indicate the positions of several conidiogenous pores. 7–9. Multiseptate conidia with obconic base and slender curved apex. Scale bars: 4, 5, 7 = 20 µm; 6, 8, 9 = 10 µm.



Figs 10–11. *Paliphora curviapicis* (holotype, SEM). 10. Colonies on natural substratum. 11. Higher magnification of a few conidiophores with smooth walls. Scale bars: 10 = 100 μm; 11 = 10 μm.



Figs 12–15. *Paliphora curviapicis* (holotype, SEM). 12. Portion of conidiophore showing three conidiogenous pores (arrows) – the dashed arrow points to a conidium beside the pores. 13–15. Portions of conidiophores; arrows indicate positions of conidiogenous pores. Scale bars = 5 μm.

of dead leaves (Table 1, Fig 16). The characteristically filiform and curved conidial apex and the sometimes sigmoid conidial shape may be conducive to spore dispersal and establishment of this species in the aquatic environment (Hyde & Goh 2003).

Table 1. Synopsis of *Paliphora* species

Species	Conidiophores	Conidia	Substratum	Distribution	References
P. aurea	Apical end pointed, 11–23-septate, 99–132 × 6–7 µm	Falcate, eguttulate, 0(–1)-septate, 6.5–9 × 1–1.5 µm	Decaying leaves	Australia, India, New Caledonia	Mouchacca 1990, Sivanesan & Sutton 1985, Rao & de Hoog 1986
P. curviapicis	Apical end rounded, 20–63-septate, 170–540 × 4.5–5µm	Elongate-fusiform with a slender, curved apex, eguttulate, 3–6-septate, 40–70 ×2–3µm	Submerged wood	Malaysia	This paper
P. inflata	Apex swollen, end pointed, 13–19-septate, 142.5–225 × 5–7.5 µm	Cylindrical, eguttulate, 0-septate, 17–20 × 1.2–2 µm	Decaying leaves	Brazil	Gusmão et al. 2008
P. intermedia	Apical end pointed, 16–22-septate, 35–205 × 10–19 µm	Cylindrical, guttulate, 1-septate, 14–19 × 2–2.5 µm	Decaying leaves	Australia, Brazil, Cuba, Mexico	Alcorn 1996, Gusmão et al. 2008
P. multiseptata	Apical end pointed, 14–16-septate, 85–210 × 6–7.5 µm	Cylindrical, eguttulate, 8–13-septate, 50–65 × 2.5 µm	Decaying leaves	Brazil	Gusmão et al. 2008
P. porosa	Apical end pointed, 15–23-septate, 200–280 × 10–15 µm	Cylindrical or clavate, guttulate, 1-septate; 12–25 × 1–2.5 µm	Decaying leaves	Brazil, Malaysia, Thailand	Gusmão et al. 2008, Kuthubutheen 1987

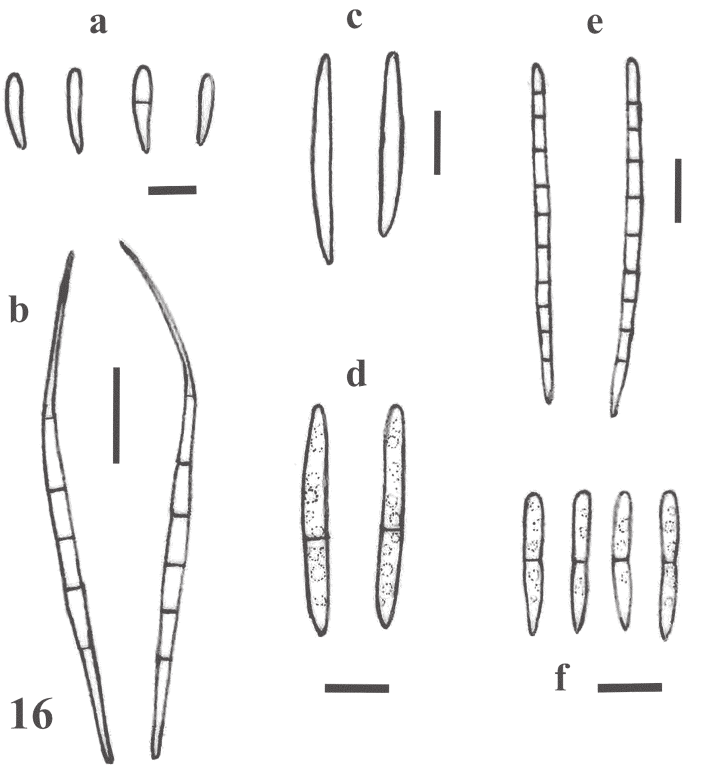


Fig 16. Composite diagram of *Paliphora* conidia: (a) *P. aurea*; (b) *P. curviapicis*; (c) *P. inflata*; (d) *P. intermedia*; (e) *P. multiseptata*; (f) *P. porosa*. Scale bars: a, c, d, f = 5 μm; b, e = 10 μm.

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